AD-A139 458 LINEAR INDUCTION ACCELERATOR(U) FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH V S BOSAMYKIN ET AL. 05 MAR 84 FTD-ID(RS)T-1821-83 1/1

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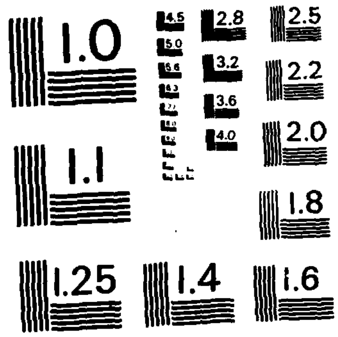
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FOREIGN TECHNOLOGY DIVISION

AIR FORCE SYSTEMS COMMAND

LINEAR INDUCTION ACCELERATOR

by

V. S. Bosamykin and A. I. Pavlovskiy

FOREIGN TECHNOLOGY DIVISION

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EDITED TRANSLATION

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LINEAR INDUCTION ACCELERATOR

By: V. S. Bosamykin and A. I. Pavlovskiy

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

LINEAR INDUCTION ACCELERATOR

V. S. Bosamykin and A. I. Pavlovskiy (authors of invention)

The invention pertains to accelerator technology.

In the known linear induction accelerators the accelerating voltage in the secondary loop of each inductor is created with an oscillating discharge of concentrated capacitance on the primary concentrated inductance. In this case the accelerating voltage has a cosinusoidal form, which limits the pulsed power of the accelerator.

For increasing the power in the proposed linear induction accelerator each inductor is made in the form of a toroidal line with distributed parameters, from one end of which in the gap of the line a ring commutator is included, and from the other end of the line a resistor is hooked up.

The drawing shows the layouts of the inductors, providing rectangular pulses of accelerating voltage. Other variants can differ by the mutual positioning of the elements of the circuit under consideration.

The long line, stacked (a) or turned (b) in the form of a torus, with high-voltage plate 1, having a ring commutator 2 in the gap AB, together with the grounded shield ACDE forms a separate inductor of the accelerator. The functioning of the inductor is analogous to the functioning of coaxial cable, which simultaneously is shorted from one end, and from the other is included in the case of a purely active load on resistor 3 of magnitude R. In the case of closing of the gap AB with the help of commutator 2 the line begins to be discharged through gap BE and commutator 2 onto resistor 3 of the accelerating interval FG, to which the voltage $U = U_0 \frac{R}{R+\rho}$,

is applied, where U_0 - charging voltage of the line, and ρ - its wave resistance. (The line of toroidal construction is not uniform, therefore by ρ here is understood the maximum value of wave resistance).

The amplitude and shape of the pulses of acceleraging voltage depend on the correlation between the variables R and ρ. The maximum strength of the electric field in the accelerating gap is reached when $R \gg \rho$.

After a time $\tau = \frac{l}{V}$, where l - length of the line and V - rate of propagation of a wave, the voltage in the accelerating interval changes sign as a result of the arrival of a wave of current, caused by the shorting of the gap AB. From this moment the voltage changes sign across the interval of time 2τ. The process bears a damping nature as a result of the active losses in the commutator, line and load.

For reducing the active losses in the line the conducting plates, forming the inductor, should have a thickness, greater than the depth of the skin-layer of currents flowing over them.

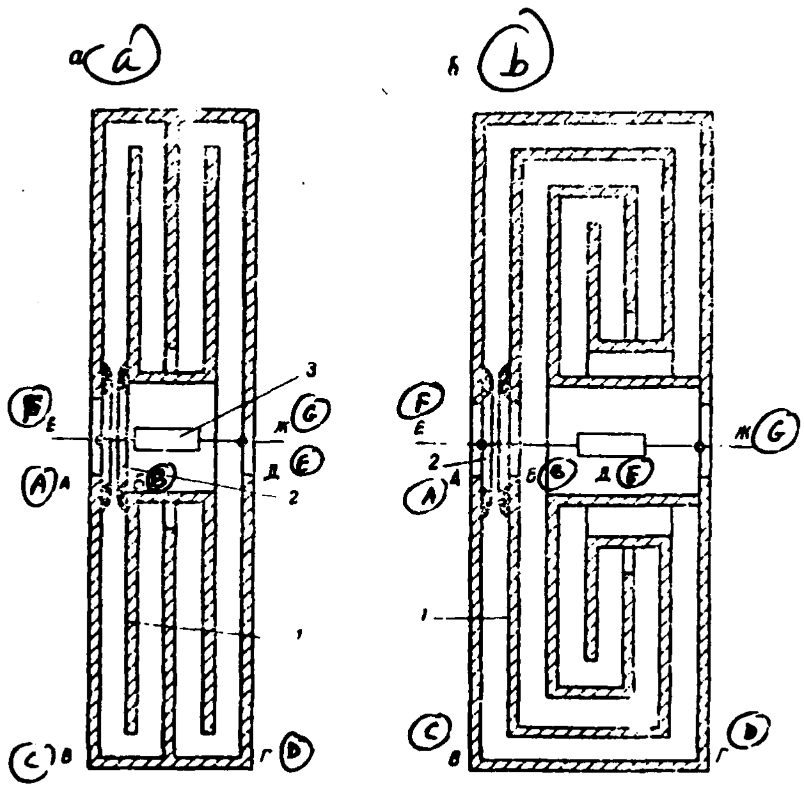
The front of the first pulse of voltage in the accelerating interval FG when $R \gg \rho$ is determined mainly by the time of development of the discharge in the commutator and its parasitic inductance. The magnetic flux, developing in the inductor, is toroidal and closed. If the inductor is assembled on several uniform lines, connected in parallel, then the width of the radial gaps between them is limited by the permissible magnitude of nontoroidal stray flows, which reduce the magnitude of accelerating voltage.

The use of such a line makes it possible to obtain rectangular pulses of accelerating voltage, which ensures the monochromaticity of energy of the accelerated particles.

It is particularly convenient to use such accelerating systems in linear induction accelerators for obtaining single or series of pulses of current of the beam of charged particles with an amplitude $> 10^4$ Å, operating with a low (≈ 0.1 Hz) repetition rate.

Object of Invention

A linear induction accelerator of charged particles, containing inductors and an acceleration circuit, characterized by the fact that for the purpose of increasing the power of the accelerator each inductor is made in the form of a toroidal line with distributed parameters, from one end of which in the gap of the line a ring commutator is included, and from the other end of the line a resistor is hooked up.



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